

REMARKS/ARGUMENTS

In the Office Action, the Examiner noted that claims 1-49 and 52-71 are pending in the application. The Examiner additionally stated that claims 1-49 and 52-71 are rejected. Claims 1-49 and 52-71 are still pending in the application.

Applicant hereby requests further examination and reconsideration of the application, in view of the following arguments.

In the Claims

Rejections Under 35 U.S.C. §102(e)

The Examiner rejected claims 1-8, 10, 24-27, 29-34, 39-49, 52 and 54-70 under 35 U.S.C. 102(e) as being anticipated by Berry, U.S. Patent 6,859,867 (hereinafter, *Berry*). Applicant respectfully traverses the Examiner's rejections.

The Berry Reference

Berry is directed to a method for using a translation and protection table (TPT) to provide access protection to a main memory in a host computer. See col. 1, lines 32-36. *Berry* discloses a network 100 in which a host computer 110 may be directly connected to I/O units (or other host computers 112) via a switched fabric 102 (such as an Infiniband or Next Generation I/O (NGIO) switched fabric); the I/O units are connected to I/O controllers, which are connected to I/O devices, which are collectively referred to as fabric-attached I/O resources. See Fig. 1; col. 3, lines 36-45; col. 4, lines 1-35. The host computer 110 includes a processor 202, a main memory 206, and a host fabric adapter 220 that connects the host computer 110 to the fabric 102. See Figs. 2 and 3; col. 3, lines 8-18.

The host computer 110 may communicate with a fabric-attached I/O resource using a Virtual Interface (VI) architecture. See col. 4, lines 61-64. In particular, an application program (also referred to as a VI consumer) running on the processor 202 of the host computer 110 may request the host fabric adapter 220 (also referred to as a VI provider) to transfer data to or from one of the fabric-attached I/O resources. See col. 5, lines 1-8. The data transfer request is in the form of a packet descriptor data structure (see Fig. 9A,

element 900 and Fig. 9B, element 912) that includes virtual addresses (see Fig. 9A, element 910 and Fig. 9B, element 928) of memory locations within the host computer 110 main memory 206 from which the data will be transferred to the fabric-attached I/O resource or to which the data will be transferred from the fabric-attached I/O resource. See col. 5, lines 16-18; col. 8, lines 14-32. Conversely, the host fabric adapter 220 may receive messages from a fabric-attached I/O resource to transfer data to/from the host computer 110 main memory 206, and the message will include the destination/source virtual address of the location within the main memory 206. See col. 8, lines 7-9.

When the host fabric adapter 220 receives a descriptor to transfer data to/from the host computer 110 main memory 206, it must translate the specified virtual addresses into physical addresses, which it does using a translation and protection table (TPT). See col. 5, lines 15-21. The TPT is stored in the host computer 110 main memory 206 “or it may be stored in a different memory area of the host” – although *Berry* does not specify any other memory areas. See col. 5, lines 31-33. Each TPT entry includes the physical addresses of host computer 110 main memory 206 pages specified by a virtual address and length in the descriptor. See col. 5, lines 27-30; Fig. 7, element 340. Each TPT entry also includes a protection domain field 350 and a region identifier field 330. See Fig. 7. When the host fabric adapter 220 receives a descriptor, it examines generates a protection domain value and a region identifier value based on the virtual address and memory handle in the descriptor (see Fig. 10, steps 1000 and 1002 and Fig. 11, steps 1100 and 1102) and identifies the entry in the TPT that pertains to the pages in the host computer 110 main memory 206 specified by the descriptor (see Fig. 10, step 1004 and Fig. 11, step 1104). The host fabric adapter 220 then compares the protection domain value and region identifier value it generates with the corresponding values in the identified TPT entry (see Fig. 10, steps 1008 and 1010 and Fig. 11, steps 1108 and 1110). If the values do not match, then the host fabric adapter 220 generates a memory fault and does not perform the requested data transfer to/from the host computer 110 main memory 206 (see Fig. 10, steps 1013 and 1014 and Fig. 11, steps 1113 and 1114); otherwise, the host fabric adapter 220 performs the requested data transfer (see Fig. 10, step 1012 and Fig. 11, step 1112).

Claim 1

Applicant respectfully asserts that claim 1 is not anticipated by *Berry* for at least the following reasons.

First, *Berry*'s host computer 110 is not a storage controller, which is what claim 1 recites. The Examiner cites the elements of the host computer 110 – namely the host fabric adapter 220 and processor 202 – as corresponding to the claimed host interface adapter and microprocessor; however, the host computer 110 is not a storage controller, which is what claim 1 recites. Furthermore, it is unclear which element of *Berry*'s host computer 110 corresponds to the claimed device interface adapter. If the Examiner intends the I/O and memory controller 204 to correspond to the device interface adapter, Applicant respectfully asserts that the I/O and memory controller 204 is not a device interface adapter because it does not interface to storage devices, which is what claim 1 recites. If the Examiner intends the I/O controller 210/212 to correspond to the device interface adapter, Applicant respectfully asserts that whereas the I/O controller 210/212 may interface to storage devices, the descriptors 900 and 912 of Figs. 9A and 9B do not specify a storage device to access; rather, they specify the virtual address of locations in the host computer 110 main memory 206.

Second, *Berry* does not teach a storage controller having a host interface adapter that determines whether a host computer identified in a request is allowed to access a logical storage device identified in the request. In particular, the host fabric adapter 220 does not use the TPT to determine whether the requesting host computer 110 or fabric-attached I/O resource is allowed to access a storage device; rather, the host fabric adapter 220 uses the TPT to determine whether a requesting process has permission to access the host computer 110 main memory 206, which is not a storage device.

Claim 24

Applicant respectfully asserts that claim 24 is not anticipated by *Berry* because *Berry* does not teach a storage controller having a host interface adapter that determines whether a host has access a logical storage device. In particular, the host fabric adapter 220 does not use the TPT to determine whether the requesting host computer 110 or

fabric-attached I/O resource is allowed to access a storage device; rather, the host fabric adapter 220 uses the TPT to determine whether a requesting process has permission to access the host computer 110 main memory 206, which is not a storage device.

Claim 52

Applicant respectfully asserts that claim 52 is not anticipated by *Berry* because *Berry* does not teach a host interface adapter determining whether a host computer has access a logical storage device. In particular, the host fabric adapter 220 does not use the TPT to determine whether the requesting host computer 110 or fabric-attached I/O resource is allowed to access a storage device; rather, the host fabric adapter 220 uses the TPT to determine whether a requesting process has permission to access the host computer 110 main memory 206, which is not a storage device.

Claim 54

Applicant respectfully asserts that claim 54 is not anticipated by *Berry* because *Berry* does not teach a storage controller having a host interface adapter that maps an external identifier that a host computer specifies to identify a storage device to an internal identifier that a microprocessor of the storage controller uses to identify the storage device. In particular, the descriptors 900/912 received by the host fabric adapter 220 do not specify a storage device; rather, the descriptors 900/912 specify locations in the host computer 110 main memory 206.

Claim 66

Applicant respectfully asserts that claim 66 is not anticipated by *Berry* because *Berry* does not teach a storage controller host interface adapter mapping a host computer identifier and a storage device identifier to a unique identifier used by a microprocessor of a storage controller to identify the storage device. In particular, the descriptors 900/912 received by the host fabric adapter 220 do not specify a storage device; rather, the descriptors 900/912 specify locations in the host computer 110 main memory 206.

Claim 67

Applicant respectfully asserts that claim 67 is not anticipated by *Berry* because *Berry* does not teach a storage controller comprising first and second microprocessors, which is what claim 67 recites. Consequently, *Berry* also does not teach a host interface adapter that determines whether a request to access a storage device specifies a storage device in a first or second set of storage devices in which access requests to the first set are processed by the first microprocessor and access requests to the second set are processed by the second microprocessor.

Furthermore, the Examiner states on page 15 of the Office Action that *Berry* teaches multiple controllers. However, Applicant respectfully asserts that neither the text of *Berry* cited by the Examiner at col. 3, lines 8-18 nor any other portion of *Berry* teaches a storage controller having two or more microprocessors, which is what claim 67 recites.

Furthermore, the text of *Berry* cited by the Examiner at col. 7, lines 14-22 states:

The region identifier field **330** is provided to further deny or allow access to the translation and protection table. The region identifier field **330** provides memory access by the host-fabric adapter **220** if the region identifier field of the virtual interface and of the memory region involved are identical. The region identifier field **330** thereby provides further protection functionality. Each translation entry associated with a specific memory region contains the same region identifier.

This text teaches a region identifier field 330 in a TPT entry, wherein the host fabric adapter 220 denies access to the host computer 110 main memory 206 if the memory region identifier generated from the descriptor does not match the memory region identifier in the TPT entry. This text does not teach a host interface adapter that determines whether a request to access a storage device specifies a storage device in a first or second set of storage devices.

With respect to claims 2-23, 25-49, 55-65 and 68-70, these claims depend from claims 1, 24, 54 and 67, respectively, and add further limitations that are neither anticipated nor made obvious by *Berry*. Accordingly, Applicant respectfully requests that the Examiner withdraw his rejections to the claims.

Rejections Under 35 U.S.C. §103(a)

The Examiner rejected claims 9 and 28 under 35 U.S.C. 103(a) as being unpatentable over *Berry* in view of Camble et al., U.S. Patent No. 6,999,999 (hereinafter *Camble*). Additionally, the Examiner rejected claims 11-12, 35-38, 53 and 71 under 35 U.S.C. 103(a) as being unpatentable over *Berry* in view of Kitamura et al., U.S. Application No. 2002/0199071 (hereinafter *Kitamura*). Finally, the Examiner rejected claims 13-23 under 35 U.S.C. 103(a) as being unpatentable over *Berry* in view of Hubis et al., U.S. Patent No. 6,343,324 (hereinafter *Hubis*). Applicant respectfully traverses the Examiner's rejections.

Claim 53

With respect to claim 53, Applicant notes that the claim language rejected by the Examiner in the Office Action is not the claim language as amended by the Amendment submitted by Applicant on 10/3/2006. Applicant respectfully requests the Examiner to examine the amended claim rather than the original claim.

Applicant respectfully asserts that claim 53 is not anticipated by *Berry* because *Berry* does not teach a storage controller having an interface adapter that implements host access controls for storage space on storage devices. In particular, the host fabric adapter 220 does not use the TPT to determine whether the requesting host computer 110 or fabric-attached I/O resource is allowed to access a storage device; rather, the host fabric adapter 220 uses the TPT to determine whether a requesting process has permission to access the host computer 110 main memory 206, which is not a storage device.

Claim 71

With respect to claim 71, Applicant notes that the claim language rejected by the Examiner in the Office Action is not the claim language as amended by the Amendment submitted by Applicant on 10/3/2006. Applicant respectfully requests the Examiner to examine the amended claim rather than the original claim.

Furthermore, Applicant respectfully asserts that claim 71 is not anticipated by *Berry* because *Berry* does not teach a storage controller having an interface adapter that maps

between hosts and storage devices. Furthermore, *Berry*'s host computer 110 is not a storage controller, which is what claim 71 recites. The Examiner cites the elements of the host computer 110 – namely the host fabric adapter 220 and processor 202 – as corresponding to the claimed host interface adapter and microprocessor; however, the host computer 110 is not a storage controller, which is what claim 71 recites.

CONCLUSIONS

In view of the arguments advance above, Applicant respectfully submits that claims 1-49 and 52-71 are in condition for allowance. Reconsideration of the rejections is requested, and allowance of the claims is solicited.

Applicant earnestly requests that the Examiner contact the undersigned practitioner by telephone if the Examiner has any questions or suggestions concerning this amendment, the application, or allowance of any claims thereof.

Respectfully submitted,

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